

**Indiana University - Purdue University Fort Wayne**  
**Opus: Research & Creativity at IPFW**

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2003 IPFW Student Research and Creative  
Endeavor Symposium

IPFW Student Research and Creative Endeavor  
Symposium

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4-15-2003

# Proceedings Student Research and Creative Endeavor Symposium

Office of Research &. External Suppourt  
*Indiana University - Purdue University Fort Wayne*

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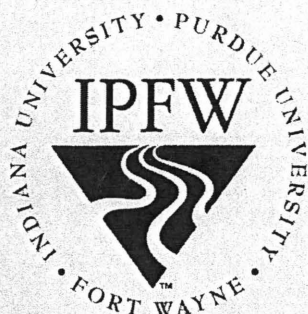
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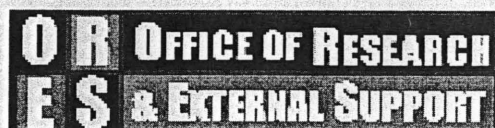


# *PROCEEDINGS*

## *Student Research and Creative Endeavor Symposium*

*April 15, 2003*

*Walb Memorial Union*



Indiana University-Purdue University Fort Wayne  
Office of Research & External Support



VICE CHANCELLOR FOR ACADEMIC AFFAIRS

April 15, 2003

Welcome to the sixth annual Student Research and Creative Endeavor Symposium. It is with great pride that the newly constituted Office of Research and External Support sponsors this Symposium. Student research is an extremely valuable part of the student experience at IPFW. In order to advance opportunities for student-centered research, ORES also sponsors the Undergraduate Student Summer Research Support Fund, the Supplies and Expenses Minigrant Program, and student travel to present results of research at regional and national professional conferences.

In addition to the many IPFW students participating, I am pleased to welcome students from Huntington College and Manchester College. Collegial interaction among students from the various colleges and universities of northeast Indiana provides an exciting opportunity to expand and enrich the experience or presenting original research.

I invite all IPFW undergraduate students to submit an application for the Pulin Sampat Memorial Undergraduate Research Award. This award, given annually to an outstanding undergraduate researcher, honors the memory of former IPFW student Pulin Sampat.

Finally, I offer a special thank you to the numerous faculty sponsors who have guided the research being presented today. Because they understand that learning is best achieved through active participation in research in the discipline, the experiences they provide are essential to the core mission of the University.

Best wishes,

Carl N. Drummond

Assistant Vice Chancellor for Research and External Support

**WALB 110**  
**9:00 – 10:20 a.m.**

**Christine Brown, Travis Johnson**

*An Examination of the Glass Ceiling in the United States*

**Dan Dalyrmple, Evaldo Lobato**

*Your Divorced – Now What?: An Investigation of Economic Ramifications of Divorce on Men and Women*

**Mpelo Ndamba, Sarah Wehrwein**

*The Feminization of Poverty: Confirmation, Causes, and Concerns*

**Tafirenyika R. Papaya**

*The Great Depression Compared to the Economy in Zimbabwe*

**Yang Sun**

*Agricultural Deregulations Policies and Exports*



**WALB 114**  
**9:00 – 10:20 a.m.**

**Shelly A Deck, Eric L. Garcia**

*A Genetic Approach for the Isolation of Arabidopsis Thaliana Mutants That Overproduce Leucine*

**Sarah E. Fey**

*Phytoremediation: Study of Lead (Pb) Tolerance in the Small Plant Arabidopsis thaliana*

**Eric L. Garcia**

*A Site-Directed Mutagenesis Interrogation of the Allosteric Region of Threonine Dehydratase/Deaminase (TD)*

**Monica Gensic, Timothy Keefe**

*Stress in Aquacultured Fish*

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**WALB 114**  
**10:40 – 11:40 a.m.**

**Timothy Keefe, Fatema Majid**

*Correlation Between pH, Temperature, and Ammonia in the Recirculating Water System and Stress in Steelhead Trout*

**Kelli Ann Whiteman**

*P69 Pertactin, Folding and Proteolysis Experiments*

**John E. Shannon, Eric L. Garcia**

*A Molecular Approach for the Overproduction of the Essential Amino Acid Leucine in Plants*

**Igor Zukhov, Steven A. Kuhl**

*Investigation of the Possible Existence of Pathogenic E. coli in Fort Wayne's Residential Ponds*

**WALB 116**  
**9:00 – 10:20 a.m.**

**Charity Hein**

*The Optimal Height for Releasing Paratroopers*

**Vicky Hogge, Ross Seibold, Joshua Cryer, April Danusis**

*Timing System for a Gravity Drag Strip*

**Philip Johnson**

*Visualizing Large Information Workspaces*

**Madhur Mathur**

*A Different Approach to the Behren Fisher Problem*

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**WALB 116**  
**10:40-11:20 a.m.**

**Chelsie Cox, Allison Hileman, Jami Imel, Becca Marquardt**

*A Healthy Smile. . . For a Lifetime*

**Shawna Jackson, Lori Winters**

*Maintaining Oral Health During Pregnancy*

**Cristalle Kline, Suzi Logsdon, Jamie Lutter**

*Joe Cool, NO, Joe Chemo*

**WALB 222**  
**9:00-10:20 a.m.**

**Jennifer Deffenbaugh, Samantha Lauer**

*The Relations Among Test Anxiety, Expectations for Exam Performance, and Method of Exam Administration*

**Rebecca Fitzgerald**

*Gender Differences in Personal Attributes and Lifestyle Choices*

**Christa Dillman, Natasha Greth, Michelle Martin**

*Students' Perceptions of Undergraduate Teaching Assistants as a Function of Time and Interpersonal Interaction*

**Kristen McMillen-Dodd**

*The Effects of Mental States, Psychotropic Medications, and Herbal Supplements on Sleep and Dream Parameters*

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**WALB 222**  
**10:40 – 11:20 a.m.**

**Michael O'Rourke, Heather Rehil, Jason Rose**

*The Effects of Parental and Child Gender on Parental Worry and Parental Restrictiveness*

**Heather Rehil, Jason Rose**

*The Effects of Self-categorization and Group Status on Cooperative Responses to Six-person Social Dilemmas*

**Nathaniel McMillen**

*Barring Nun: Women Pastors in the Roman Catholic Church*

**WALB 224**  
**9:00 – 10:20 a.m.**

**Kim Dietrich**

*Beyond Advising and Leading: The Perception of Being Mentored*

**Erin Edison**

*English as a Second Language Students and Communication at IPFW*

**G. Spencer Owen**

*Spiritual Warfare in the United States: Political Rhetoric and Public Opinion (President Roosevelt's Use of Gods and Devils Rhetoric in His "Arsenal of Democracy" Speech on 29 Dec. 1940)*

**Michael R. Ormiston**

*Buffalo Bill and Annie Oakley Visit Fort Wayne, Indiana*

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**WALB 224**  
**10:40 – 11:20 a.m.**

**Brooke Nichols**

*Student-Campus Fit: What Students Need, and What They Get*

**Mindy Richeson**

*Effects of the Accelerated Math Program Regarding Fifth Grade Pupils' Attitudes Towards Mathematics*

**Joe Schaller**

*Bishop Dwenger High School: A Saint is Born*

# An Examination of the Glass Ceiling in the United States

Christine Brown and Travis Johnson

Dr. Hedayeh Samavati

Department of Economics

Indiana University-Purdue University Fort Wayne

The glass ceiling can be defined as an invisible barrier that prevents women from reaching executive and upper level management positions. Research shows that men dominate these positions in corporate America. However, when women and men of similar experience and education are compared, women earn as much as their male counterparts and they are better paid at a younger age. This suggests women have the faculty to attain these positions. Since women executives are just as successful as men, in terms of compensation, why does such gender disparity exist in upper level management? This paper examines this phenomenon by investigating such issues as gender roles, personality characteristics and leadership styles of women. Other considerations such as family responsibilities, and the impact that they have on women in the workplace will also be examined.



# You're Divorced- Now What? : An Investigation of Economic Ramifications of Divorce on Men and Women

Dan Dalrymple, Evaldo Lobato

Hedayeh Samavati

Department of Economics

Indiana University-Purdue University Fort Wayne

The divorce rate in the U.S. reached 43% in 1995 and is predicted to reach a staggering 50% in 2003. This means that half of all marriages will end in divorce. With divorce seeming so prevalent these days, it seems that many couples are being married with the forethought that there is a way out if the need arises. The world today in the United States has deemed divorce as a plausible way to allow a marriage to be ended with both husband and wife being vindicated. It is this newly found ideology that has spurred our interests into understanding the economic ramifications of divorce on men and women. Is this a new paradigm shift? How does this dissolution of marriage affect the husband and wife monetarily? What impact is felt by the workforce? What does cost/benefit analysis suggest in terms of understanding our society's acceptance of the institution of divorce. In our examination of economic impact of divorce, not only do we focus on gender differentiation, but also we consider social categories of race/ethnicity and class.

# The Relations Among Test Anxiety, Expectations for Exam Performance, and Method of Exam Administration

Jennifer Deffenbaugh and Samantha Lauer

Dr. Lesa Rae Vartanian

Department of Psychology

Indiana University-Purdue University Fort Wayne

On-line testing was introduced as an optional method by which students enrolled in PSY 235 - Child Psychology could take their unit exams. Students completed self-report surveys measuring a) their level of test anxiety prior to and during the exam; b) the method by which they elected to take the exams (e.g., on-line versus in-class), c) their score on the exam, and d) the extent to which that score met their expectations for their performance on the exam. Students were also asked to comment on what they saw to be the benefits and drawbacks of each testing option. Students completed the surveys following the second ( $n = 77$ ), third ( $n = 66$ ), and fourth unit exams ( $n = 64$ ). The results of descriptive analyses illustrating the extent to which students utilized the on-line testing option and their perceptions of the option will be presented and discussed, along with the results of correlational analyses exploring the extent to which students' self-reported test anxiety and expectations for exam performance were related to the method of testing they chose.

## Student's Perceptions of Undergraduate Teaching Assistants as a Function of Time and Interpersonal Interaction

Christa Dillman, Natasha Greth, and Michelle Martin

Dr. Lesa Rae Vartanian

Department of Psychology

Indiana University-Purdue University Fort Wayne

Students in PSY 235-Child Psychology have access to peer support for their learning in the course vis-a-vis undergraduate teaching assistants (UTAs). How do students perceive UTAs, and do their perceptions change over the course of the semester? At the beginning of the semester, PSY 235 students completed a brief survey measuring their perceptions of the UTAs' knowledge, helpfulness, and availability, and the extent to which they anticipated using the UTAs as a resource to support their learning as the semester progressed. A second survey was administered at mid-semester in order to assess the extent to which changes in perceptions could be assessed. The second survey asked students to indicate the extent to which they had contact or interpersonal interaction with one or more of the UTAs to date (e.g., during class, via e-mail, etc.). A total of 128 students completed both surveys. Students' baseline perceptions of the UTAs will be discussed and compared to their mid-semester perceptions; the results of correlational analyses assessing the relations among students' earlier and later perceptions of the UTAs, the amount and types of contact they have had with the UTAs, and their first two unit exam scores will be presented and discussed.

## Phytoremediation: Study of Lead (Pb) Tolerance in the Small Plant *Arabidopsis thaliana*

Sarah E. Fey

Michael R. Columbia and George S. Mourad

Departments of Chemistry and Biology

Indiana University-Purdue University Fort Wayne

Characterization of heavy metal uptake and tolerance in plants has become more widely studied to develop applications that use plants to clean up toxic heavy metal soil contamination. This technology, phytoremediation, has especially been applied to lead (Pb) contamination. Since lead is not a plant nutrient, genetic engineering of plants to enhance Pb uptake, sequestration and translocation is needed. To study possible mechanisms for lead tolerance in plants, EMS-mutagenized seeds of *Arabidopsis thaliana* were screened on a lead medium optimized for selection of lead tolerance. One mutant line showed tolerance to Pb after germinating the M<sub>3</sub> generation on medium containing 0.2 g/L Pb. Comparison of mutants to wild type on higher concentrations of Pb demonstrated mutant tolerance to Pb. Measurement of the intracellular content of lead in plant tissues using ICP-AES will determine whether the mechanism of mutant Pb tolerance is due to avoidance of Pb or due to intracellular Pb sequestration. Additionally, plants will be genetically engineered to over-express the gene encoding for glutathione synthetase (*gshII*), an enzyme involved in the synthesis of phytochelatins (PCs). Intracellular chelation of heavy metals with PCs and subsequent complex sequestration into vacuoles is the mechanism by which plants detoxify these metals. Over-production of PCs is expected to enhance lead tolerance. The *gshII* gene was subcloned into the pCM35S plant binary expression vector and will be used to transform wild type *Arabidopsis thaliana*. Transformants will then be selected and tested for Pb tolerance on Pb-supplemented medium. The amounts of Pb taken up by the transformants versus the wild type will be assessed using ICP-AES.

## A Site-Directed Mutagenesis Interrogation of the Allosteric Region of Threonine Dehydratase/Deaminase (TD)

Eric L. Garcia

George S. Mourad

Department of Biology

Indiana University-Purdue University Fort Wayne

TD is the key regulatory enzyme of the metabolic pathway leading to isoleucine biosynthesis in bacteria, yeasts, fungi and plants. When levels of isoleucine build up in a cell, isoleucine binds to TD changing its conformation and thus slowing down the production of more isoleucine (negative feedback control). In the small plant *Arabidopsis thaliana*, a mutant was isolated that overproduced isoleucine by 20-fold (Mourad and King, 1995). The mutation mapped to a new gene *omr1.1* which contained two point mutations of the base substitution type that leads to two amino acid substitutions at residues #499 and #544 of TD (Mourad et al., 1998; 2000). With the objective of maximizing the overproduction of isoleucine in plants for producing better food, we introduced 6 independent novel mutations in the wild type gene encoding TD of *Arabidopsis*. Each of the 6 new mutant alleles was spliced in front of the strong constitutive promoter CaMV 35S of the plant binary vector pBI121.1. Each of the 6 new mutant alleles was independently engineered into wild type *Arabidopsis thaliana* plants with the aid of *Agrobacterium tumefaciens* and the vacuum-infiltration method. All of the 6 different genetically engineered plant lines were able to germinate and grow in the presence of the toxic analog L-O-methylthreonine, an indication of their ability to overproduce isoleucine. We will further characterize these lines by assaying the sensitivity of their TD to isoleucine inhibition and by quantifying the amount of free isoleucine they produce using HPLC analysis.

Mourad G., King J. (1995) L-O-methylthreonine-resistant mutant of *Arabidopsis* defective in isoleucine feedback regulation. *Plant Physiology* 107:43-52.

Mourad G., Emerick R., Marion A., Smith A. (1998) Cloning and sequencing of a cDNA encoding threonine dehydratase/deaminase of *Arabidopsis thaliana* (Accession No. AF096281). *Plant Physiology* 118: 1534.

Mourad G., Emerick R., Smith A. (2000) Molecular cloning and sequencing of a cDNA encoding an isoleucine feedback insensitive threonine dehydratase/deaminase of *Arabidopsis thaliana* (Accession No. AF177212). *Plant Physiology* 122: 619.



# The Optimal Height for Releasing Paratroopers

Charity Hein

Dan Coroian

Department of Mathematical Sciences

Indiana University-Purdue University Fort Wayne

When paratroopers are released from a plane during combat they must be dropped high enough so that there is enough time for the parachute to slow the descent and prevent injuries from the impact upon landing. At the same time, they must be released low enough such that they spend a minimal amount of time in the air where they are exposed to enemy fire. The purpose of this project is to determine the optimal height for the paratroopers to be released which will provide a safe landing and minimize their air time.

## Maintaining Oral Health During Pregnancy

Shawna Jackson and Lori Winters

Nancy K. Mann, RDH, MSED.

Department of Dental Hygiene

Indiana University-Purdue University, Fort Wayne

Changes can take place inside the mouth during pregnancy. Increased hormone levels are known to be a source of changes, especially in soft tissues. It has been well documented that periodontal disease can be a risk factor in pre term low birth weight babies. This presentation is an information guide on oral health to women who are pregnant or plan to become pregnant. This includes basic information about the teeth and how to take care of them as well as nutritional aspects for the new mother and infant. Also included is information about pregnancy and the influence this has on oral health and the affect oral health status has on the baby. The role of nutrition is discussed, as well as the hazards of tobacco products. The dental hygienist has an important role in caring for the pregnant patient as well as being a resource for infant oral care.

# Pregnancy and Periodontal Disease

The bacteria from periodontal disease can enter the blood stream and travel to major organs and begin new infections:

- Increase risk of heart disease and stroke
- Increase a woman's risk of having a pre-term, low birth weight baby
- Pose a serious threat to people whose health is compromised by diabetes

*The*  
**Mouth-Body**  
*Connection*



## Correlation Between pH, Temperature, and Ammonia in the Recirculating Water System and Stress in Steelhead Trout.

Timothy Keefe and Fatema Majid

Ahmed Mustafa

Department of Biology

Indiana University-Purdue University Fort Wayne

Recirculating water systems, by using less water and space than traditional aquaculture ponds, offer a feasible way to conduct both research and farming of fish. These systems, however, must be constantly maintained to ensure optimal water quality for the fish. One of the common problems encountered in these recirculating systems is high ammonia levels, resulting from the release of organic waste within the system. These high ammonia levels can lead to stress and ultimately death of the fish. Based on observations made in our lab over the past year and various comments from other peer-reviewed articles in the aquaculture field, it has been observed that lethal ammonia doses tend to be correlated with fluctuations in the pH and temperature of the system, with high temperature and low pH being found in tanks with high ammonia. These findings, however, have not been shown experimentally. In this experiment, we wanted to check these parameters to find a definitive correlation between pH, temperature, and ammonia levels in the tank, as well as stress levels in the fish. Successful completion of this research may lead to findings that help regulate ammonia levels in recirculating systems by carefully controlling the pH and temperature of the tank. Results from the experiment will be presented in the IPFW student research and creative endeavor symposium.

# A Different Approach to the Behren Fisher Problem

Madhur Mathur

C. K. Chauhan

Department of Mathematical Sciences

Indiana University-Purdue University Fort Wayne

The Problem of testing the equality of means of two populations plays an important role in many areas such as Biology, Agriculture, and Psychology . It is not surprising that its solution under various situations has been discussed by different authors. In the simplest case of two independent populations with known standard deviations, the hypothesis is tested by the well known Z test statistic. However, in practice standard deviations are unknown and therefore assumed unequal.

Unfortunately, testing the equality of means is not straightforward when the standard deviations are **unequal** and **unknown**. This problem, known as **Behren Fisher Problem**, has been considered by many authors. One approach is to use sample standard deviations as estimates for the population standard deviations. The main problem with this approach is that the statistic thus obtained does not have an exact distribution.

Let  $x_i$  ( $i=1,2,\dots,n$ ) be a random sample from a normal population with mean  $\mu_x$  and variance  $\sigma_x^2$  and  $y_i$  ( $i=1,2,\dots,m$ ), ( $m < n$ ) be a random sample from another normal population with mean  $\mu_y$  and variance  $\sigma_y^2$

Some authors have proposed the following approach: Consider the difference,  $d_i = x_i - y_i$ ,  $i=1,2,\dots,m$ . Note for equal population means, the mean value of  $d_i$  is equal to zero. Thus a test statistic based on the  $d_i$  is used with an approximate t-distribution. However this approach has two problems: It results in wastage of data from the larger sample in unequal samples and the numerical value of the statistic is order dependent. Schaffe has suggested a modified approach in which all the data are used, but still order dependent.

In this research project, we propose a different procedure for testing the equality of means from two independent populations with unknown and unequal variances. Our proposed test does not require equal sample sizes from the two populations and is independent of the order in which the data is written. Our proposed test is based on the  $d_i$ 's, where  $d_i$  are calculated by taking all possible differences,  $x_i - y_j$ ,  $i=1,\dots,n$ ,  $j=1,\dots,m$ . Note, however, some of the  $d_i$  and  $d_j$  are pairwise independent, while others are not. Our proposed test statistic is a function of  $d_i$ , and the covariance between  $d_i$  and  $d_j$ . Our approach involves the use of The Moore-Penrose Inverse of a singular matrix calculated by MATLAB.

# The Effects of Mental States, Psychotropic Medications, and Herbal Supplements on Sleep and Dream Parameters.

Kristen McMillen-Dodd

Amy J. Silvestri, Lesa R. Vartanian and Brenda Lundy

Department of Psychology

Indiana University-Purdue University Fort Wayne

This study investigated the effects of mental states, psychotropic medication, and herbal supplements on sleep and dream parameters. The purpose of the present study was to measure dream parameters in individuals who have been using herbal supplements, and to replicate and expand on previous findings that dream parameters are correlated with depression, anxiety, the use of antidepressants and anti-anxiety medication. Participants self-reported their dream characteristics, anxiety, depression, medication, and herbal supplement usage. The results demonstrated that state and trait anxiety and depression scores were related to measures of dream intensity, but not to dream frequency. In subjects taking Selective Serotonin Reuptake Inhibitors (SSRIs), there was a significant relationship between depression score and dream frequency. Subjects taking herbals had similar dream intensity scores to the SSRI group, but had higher levels of trait anxiety than all other groups. This suggests that anxiety, depression, and antidepressants are each uniquely related to dream parameters, and that herbal supplements may act like SSRIs on dream parameters.



## Student-Campus Fit: What Students Need, and What They Get

Brooke Nichols

Brad Gilbreath

Organizational Leadership and Supervision

Indiana University-Purdue University Fort Wayne

This study is examining the fit of college students with their university. It is guided by person-environment (P-E) fit theory, which is based on the assumption that one's psychosocial environment can affect well-being and performance. Good fits between people and their environments are thought to promote health and contribute to morale, satisfaction, motivation, working capacity, and feelings of mastery and self-confidence. We assessed the following student-campus fit factors: physical environment (e.g., campus layout, aesthetics, geographical location), student body, faculty, academic climate, and support systems. We also measured student proactivity as a potentially influential moderator variable. Outcomes (i.e., dependent variables) measured included institutional identification, satisfaction, academic success, and emotional well-being. Data was collected, using a questionnaire, from 224 students at IPFW and IUPUI. Our preliminary analysis of the data has focused on students' needs and the extent to which these needs are being met by their campus. This presentation will discuss fit factors considered most important by IPFW students, factors which IPFW rated most highly on, the values held most important by IPFW students, and the relationship between student proactivity and satisfaction.

# The Effects of Parental and Child Gender on Parental Worry and Parental Restrictiveness

Michael O'Rourke, Heather Rehil and Jason Rose

Carol Lawton

Department of Psychology

Indiana University-Purdue University Fort Wayne

The present research examined the effects of gender on actual and perceived parental restrictions placed upon children. This research was conducted via two separate surveys: Parents' reports of current restrictions on their children and adults' retrospective accounts of past restrictions during their childhoods. Variables examined in the parent survey included: the effect of parental gender on restrictiveness and worry about harm from strangers, the effect of child gender on parental worry and the effect of parent gender on the parents' feeling of safety as it relates to restrictiveness. Variables examined in the adult retrospective survey included the effect of participant gender on perceived parental restrictiveness. Upon analysis, both surveys revealed significant results concerning parental worry, restrictiveness and gender. Specifically, parents worried more about daughters being harmed by strangers than sons. Parents who are more restrictive worry more about their children being harmed by strangers. In the survey of adults recalling childhood restrictiveness, women reported higher levels of parental restrictiveness than did men. Overall, there appeared to be discrepancies between actual parent restrictions on daughters and sons and retrospective perceptions of parental restrictiveness. Explanations for this discrepancy will be discussed.

# The Great Depression Compared to the Economy in Zimbabwe

Tafirenyika R Papaya

Brian Peterson

Department of Economics

Manchester College

The paper aims to compare the Great Depression of the United States to the current economic upheaval in the Southern African nation of Zimbabwe. The main impetus is to come up with a reason to explain why the United States economy can rebound when it gets into turmoil, where as the economy of a third world nation, like Zimbabwe cannot.

To begin with the author tackles the Great depression from the view of a foreign national unaccustomed to a lot of American nuances. He analyses the data from an economic, sociological and political perspective. The author gives a detailed account of the major issues that caused the depression economically, sociologically and politically with adequate data in the form of figures to back the claims.

The author gives a three pole analysis of the Zimbabwean economy after independence in 1980. From its initial foundation in Socialism, to its change to a Capitalist economy, the author tries to bring the ordinary lay man a sense of understanding of the main economic dynamics that are present in the current Zimbabwean economy. Figures are given from credible Zimbabwean and international sources, which helps this part of the paper act as a brief summary of a case study of the economic situation in Zimbabwe.

After setting up the framework for comparison the author then compares the two situations, looking at it from an angle of somebody who wants to explain why the USA can easily rebound from economic misfortune and Zimbabwe cannot. Some strong theories come in at this point in an effort to stimulate the reader into some kind of discourse about the subject matter. The author ends by telling people how difficult it is to implement policies that work in the USA in a country like Zimbabwe.

## P69 Pertactin, Folding and Proteolysis Experiments

Kelli Ann Whiteman

Patricia L. Clark

Department of Biochemistry

Huntington College

Pertactin is a 60kDa protein with a native structure made up of a sixteen rung parallel  $\beta$ - helix. This monomeric, extracellular protein is manufactured by *Bordatella pertussis*, the bacteria that causes whooping cough. Pertactin mediates the adhesion of the bacterial cell to the ciliated cells of the upper respiratory tract, and the protein may be used in future vaccines for whooping cough. The mechanism by which unfolding and refolding occur in native pertactin and in a mutant version of the protein have been examined. The mutant is a truncated protein missing a proline rich loop hypothesized to interfere with reversible refolding. Refolding of both types of the protein is efficient with low concentrations of denaturant, and can be examined using fluorescence spectroscopy due to the presence of tryptophan chromophores within the amino acid sequence of the protein. Both types of pertactin appear to exhibit three-state behavior and unfold via an intermediate species. Hysteresis seen in folding experiments is attributed to kinetic parameters. Reversible refolding of native pertactin appears, after 3 weeks of incubation. However, with the truncated version of the protein reversible refolding can be seen in less than 2 days. A series of proteolysis experiments have been completed in an attempt to probe the structure of both native pertactin and the intermediate seen in folding experiments. Initial results for native pertactin show at least two relatively stable peptide fragments at the conclusion of proteolysis. However, similar fragments are not observed in proteolysis of the intermediate protein. Further proteolysis experiments are needed to gain more insight into the structure of the native pertactin intermediate, as well as the truncated mutant.

## **PULIN SAMPAT MEMORIAL UNDERGRADUATE RESEARCH AWARD**

IPFW students who have conducted undergraduate research may be eligible for the annual Pulin Sampat Memorial Undergraduate Research Award.

A five-member panel of judges, comprised of four faculty members from four different schools within IPFW as well as one undergraduate judge selected by the International Students' Organization, will select the winner. The recipient of this award will receive a \$250 prize and will be recognized at the IPFW Honors Convocation on October 5, 2003.

Following are the terms and conditions of the award:

1. The applicant must be an IPFW undergraduate at the time the research was conducted.
2. The research may be in *any* discipline and conducted with or without the supervision of an IPFW faculty member, and in or not in an IPFW course.
3. The research may or may not have been published.
4. The applicant must be an IPFW undergraduate or a graduate who earned an undergraduate degree at IPFW within the past year.

The applicant must explain the nature and significance of the research in sufficient detail to enable the faculty and undergraduate judges in unrelated disciplines to evaluate it accurately.

***Deadline:***

***Applications are available in the Office of Multicultural Services, Walb Student Union, Room 118, and must be returned to that office by May 15, 2003.***

For more information contact Nancy Vojtash Moore, (260) 747-2487.



**Pulin Sampat Memorial  
Undergraduate Research Award  
Application**

Name \_\_\_\_\_

Address \_\_\_\_\_

Telephone \_\_\_\_\_ e-mail \_\_\_\_\_

Research Topic/Title: \_\_\_\_\_

Research date of completion: \_\_\_\_\_

Please attach a summary or abstract of your research. You must explain the nature and significance of the research in sufficient detail to enable the faculty and undergraduate judges in unrelated disciplines to evaluate your research accurately.

*Check (and complete) all that apply:*

☐ Undergraduate IPFW student.

If undergraduate student, IPFW department \_\_\_\_\_

☐ Graduate IPFW student.

If graduate student, undergraduate degree earned at IPFW:

Date of graduation: \_\_\_\_\_

The research ☐ was ☐ was not conducted under the supervision of an IPFW faculty member.

If so, faculty member: \_\_\_\_\_

The research ☐ was ☐ was not conducted in an IPFW course.

If so, IPFW course: \_\_\_\_\_

The research ☐ was ☐ was not published.

If so, journal name and date of publication:

Journal: \_\_\_\_\_

Date of publication: \_\_\_\_\_

The research ☐ was ☐ was not presented at a conference.

If so, conference name(s) and date(s):

\_\_\_\_\_ date

\_\_\_\_\_ date

**Deadline:** *Applications must be submitted by May 15, 2003, to  
Multicultural Services, IPFW, Walb Student Union, Room 118.*

For more information, contact Nancy Vojtash Moore, (260) 747-2487.